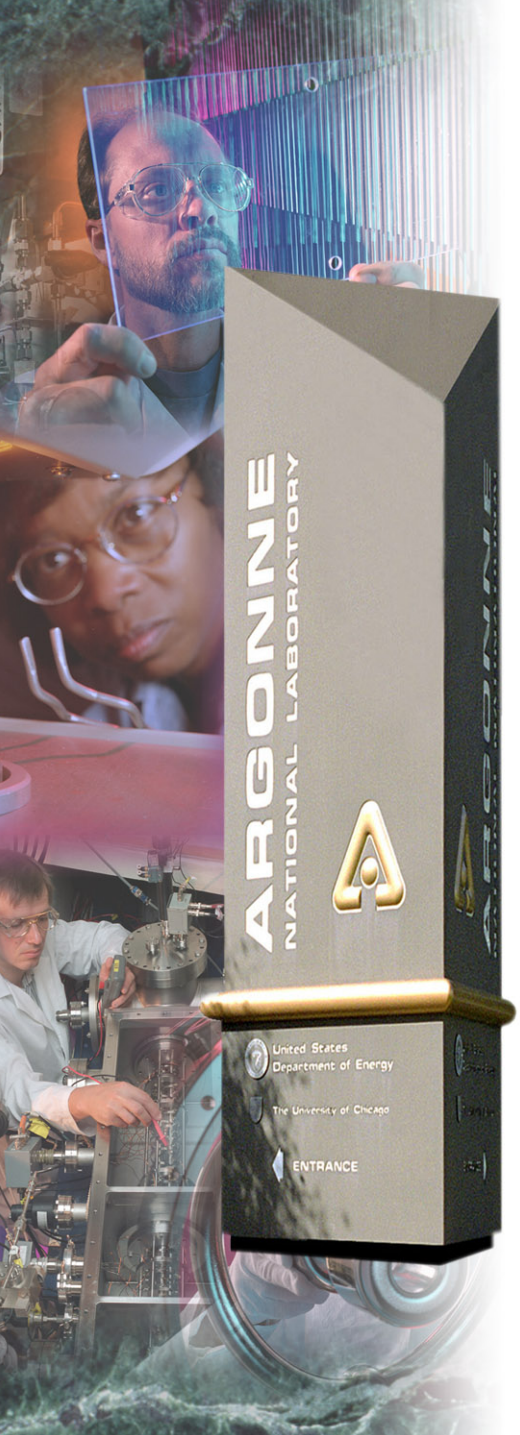



# *Modeling and Simulation Tools for Emergency Management Applications*

*Dr. John Hummel*
*Advanced Simulation Technologies Center*
*Decision and Information Sciences Division*

***Argonne National Laboratory***

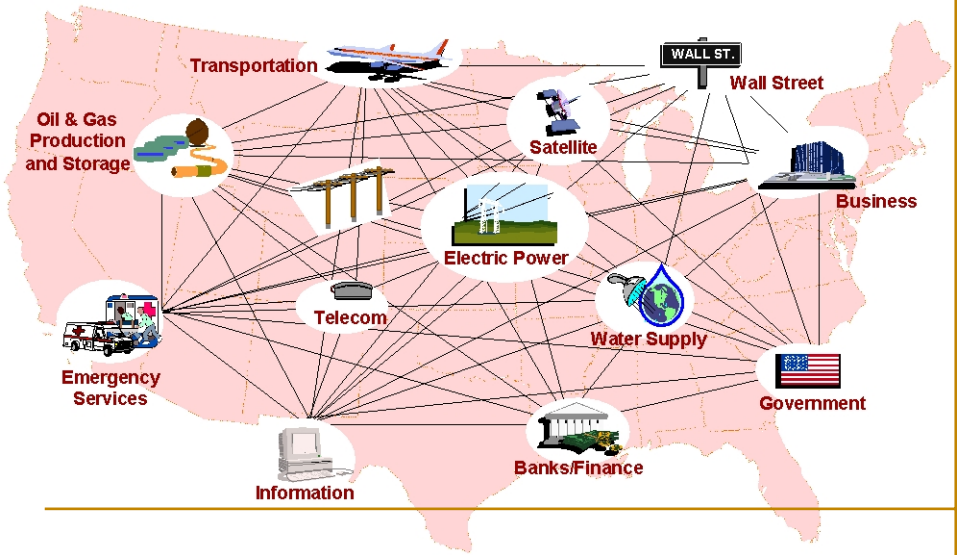
Office of Science
U.S. Department of Energy

*A U.S. Department of Energy*
*Office of Science Laboratory*
*Operated by The University of Chicago*

# *Overview of Argonne Modeling & Simulation Tools for Emergency Management Applications*

- M&S for Critical Infrastructure Protection Analyses
- Leveraging DoD's Mobility and Deployment Tools
- Understanding Interdependencies in Emergency Response Activities
- Planning and Conducting Emergency Response Exercises
- Development of Emergency Response Information Management Systems
- Software Frameworks for Complex M&S Applications

# Critical Infrastructure Protection Modeling and Simulation Analysis Tools



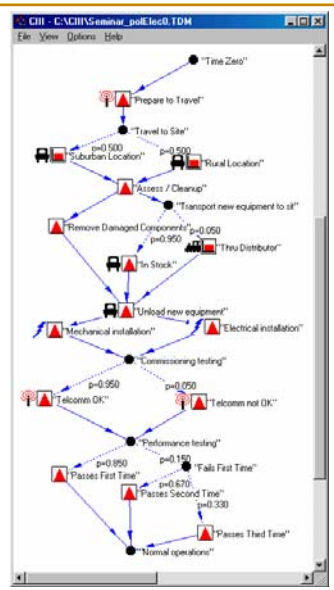

**CI³ - Critical Infrastructures Interdependencies Integrator**

Software tool for estimating the amount of time or cost (or both) needed for activities that must be completed to restore an infrastructure component, system or systems to an operational state.

## Infrastructure Assurance Center

**Established in 1998 as a Response to Presidential Decision Directive 63**

***"To develop and apply innovative and cost-effective infrastructure assurance technologies and capabilities to meet critical infrastructure protection needs at the local, regional, and national levels"***

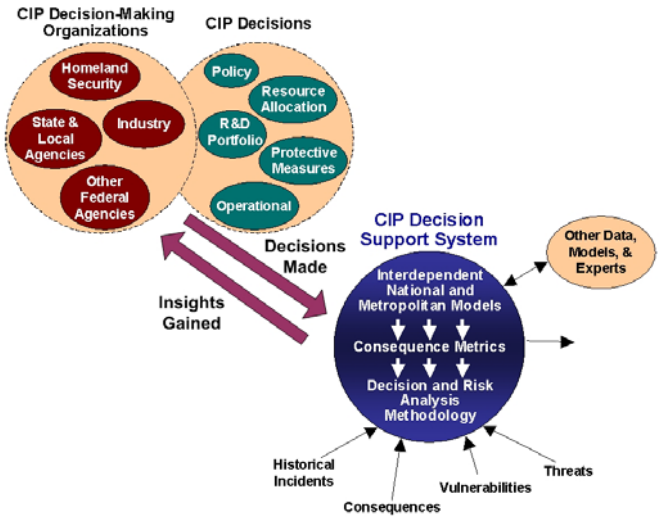




POC:

Dr. James Peerenboom
Infrastructure Assurance Center
Argonne National Laboratory
9700 S. Cass Avenue/ Bldg. 900
Argonne, IL 60439 IL
630.252.8994
jpeerenboom@anl.gov

# *Critical Infrastructure Protection Decision Support System*




Los Alamos NATIONAL LABORATORY

Sandia National Laboratories

## CIP DSS Analyses Address:

- Consequences of attacks
- Identifies if choke points exists in critical infrastructures
- Risk areas and vulnerabilities
- Investment strategies for improvement

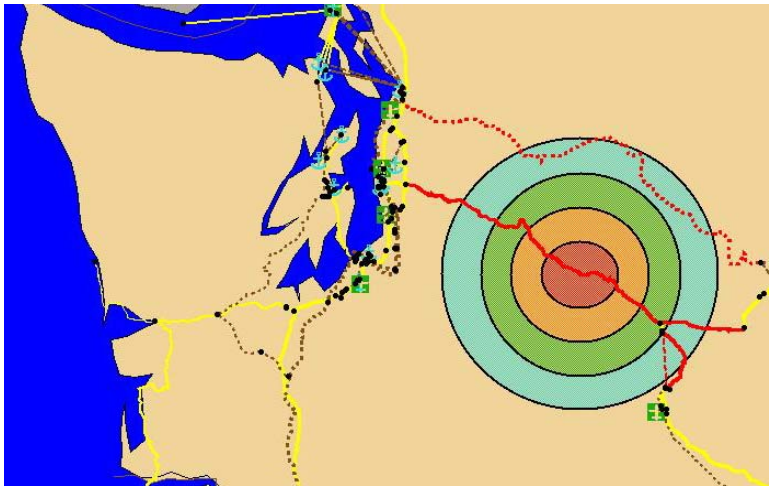
## Critical Infrastructure Protection Decision Support System

To develop a risk-based decision support system that provides insights for making critical infrastructure protection decisions by considering all 14 critical infrastructures and their primary interdependencies.

## POC:

Dr. Michael E. Samsa
Decision and Risk Analysis Group
Decision and Information Sciences Division
Argonne National Laboratory
9700 S. Cass Avenue/DIS-900
Argonne, IL 60439
630-252-4961
msamsa@anl.gov

# *Leveraging DoD's Mobility / Deployment Tools for Emergency Response*



## ANL-Models Span the Deployment Spectrum and can be Used in Emergency Response Studies

**Origin, Destination, or Installation Processes:**
- FPM
- TRANSCAP
- RULST Tool
- 2-D, 3-D Visualization
- Fort Future

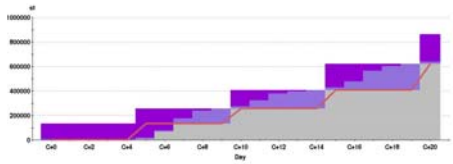
**Port Processes:**
- PORTSIM
- RULST Tool
- 2-D, 3-D Visualization

**CONUS Movement:**
- CONUS-ELIST

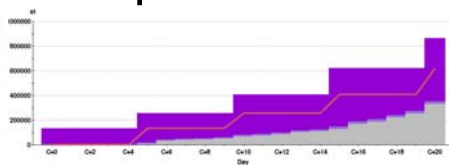
## Mobility/Deployment Issues of Emergency Response are Similar to those in Military Situations

- How quickly can I get critical supplies/people to where I need them?
- How do I adjust if key links are disrupted?

Normal Network

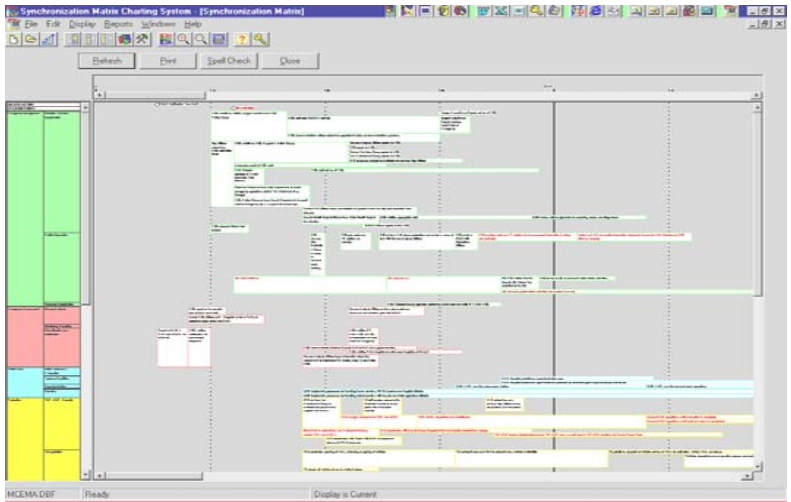


Earthquake Disrupted Network




POC:
Dr. Charles N. VanGroningen
Decision and Information Sciences Division
Argonne National Laboratory
9700 S. Cass Avenue/ Bldg. 900
Argonne, IL 60439 IL
630.252.5308, vang@anl.gov

# *Understanding Interdependencies in Emergency Response Activities*



The **Emergency Response Synchronization Matrix** (ERSM) supports a systems-based approach to emergency response planning. ERSM offers a proven method to coordinate, integrate, and synchronize emergency response across time and space. It graphically portrays the response activities performed by participating jurisdictions and organizations.

## DIS Center for Integrated Emergency Preparedness

Established in 2003 in response to HSPD-5.

*"Increase the knowledge, skills, and effectiveness of emergency preparedness professionals in dealing with natural, technological, and terrorism disasters, both nationally and internationally."*

## POC:

Dr. William Metz
Center for Integrated Emergency Preparedness
Decision and Information Sciences Division
Argonne National Laboratory
9700 South Cass Avenue, Building 900
Argonne, IL 60439
630.252.3271
wmetz@anl.gov

INTEGRATE
COORDINATE
SYNCHRONIZE
Emergency Response Synchronization Matrix

# Planning and Conducting Emergency Response Exercises


The **Comprehensive Exercise Design and Data Tracking System** (CEDATS) supports the DHS National Exercise Program, allowing users to plan and conduct emergency response exercises. This web-based application can be used for "all hazards" and all operational (drills to full-scale) exercises, ranging from local to national level response.

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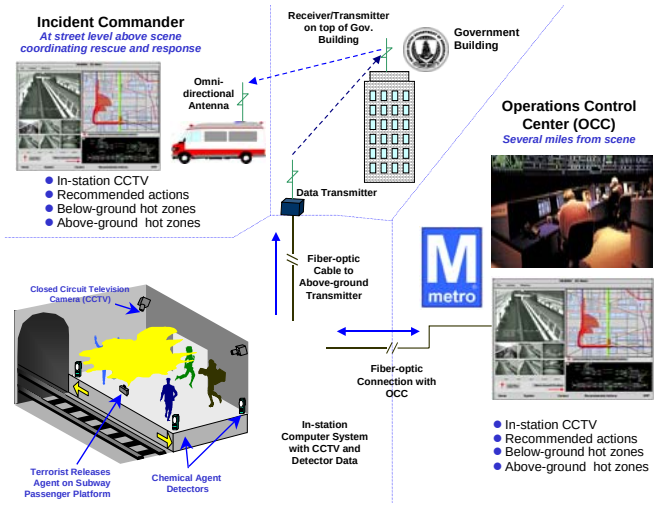
## POC:

Dr. William Metz
Center for Integrated Emergency Preparedness
Decision and Information Sciences Division
Argonne National Laboratory
9700 South Cass Avenue, Building 900
Argonne, IL 60439
630.252.3271
wmetz@anl.gov

# Development of Emergency Response Information Management Systems




**PROTECT** combines data, video, and modeling and simulation results in a flexible information management framework to enable first responders to observe, analyze, and prepare response scenarios in real-time, including while enroute to the incident.

## Program for Response Options and Technology Enhancements for Chemical/Biological Terrorism) - PROTECT

A information management system for chemical/biological incidents in public facilities for emergency management first responders

## POC:


Dr. Anthony J. Policastro
Infrastructure Assurance Center
Argonne National Laboratory
9700 South Cass Avenue, Building 900
Argonne, IL 60439
630.252.3235
policastro@anl.gov

# *DIAS – A Software Framework for Complex Program Development*


**DIAS** is a patented and *government-owned* software framework. DIAS has been used in a variety of research and operational applications in the government, commercial, and academic sectors and applied on a variety of problem domains (e.g., military, environmental, societal, medical simulations, etc.)

## Dynamic Information Architecture System - DIAS

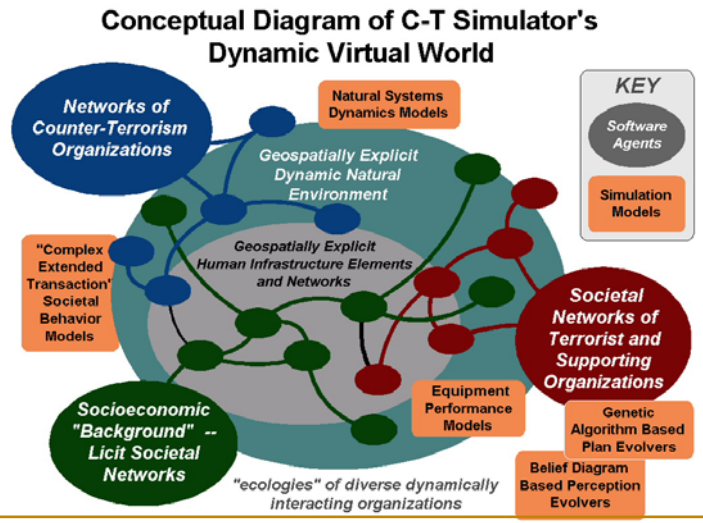
A subject-domain independent, object-based software framework for integrating simulation components for complex analyses and applications. **DIAS** is patented and *government-owned*.

## POC:

Dr. John R. Hummel
Advanced Simulation Technologies Center
Argonne National Laboratory
9700 South Cass Avenue/DIS-900
Argonne, IL 60439
630.252.7189
jhummel@anl.gov

DIAS
DYNAMIC INFORMATION ARCHITECTURE SYSTEM

# Complex Adaptive System Terrorism and Countermeasures Simulator




**CASCADE** provides the means for the simulated adversaries to adapt their behavior dynamically and spontaneously in response to their perceived situation and experience in the simulation, based on their own fundamental goals and constraints, in ways not biased by C-T analysts' expectations or past experience.

## **C**omplex **A**daptive **S**ystem **C**ountermeasure **A**nalysis **D**ynamic **E**nvironment - **CASCADE**

An object-based software system for constructing and running agent-based multidisciplinary simulations that concurrently address socioeconomic, psychological, and environmental factors and constraints to support countermeasures analysis.

## POC:


Mr. John H. Christiansen
Advanced Simulation Technologies Center
Argonne National Laboratory
9700 South Cass Avenue, Building 900
Argonne, IL 60439
630.252.3291
christiansen@dis.anl.gov